भारतीय मानक
Indian Standard

IS 17726 : 2021

लकड़ी की लुग़दी — विशिष्टि

Wood Pulp — Specification

ICS 85.040

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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

November 2021 **Price Group 5**

Paper and its Products Sectional Committee, CHD 15

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Paper and its Products Sectional Committee, had been approved by the Chemical Division Council.

Pulp is a lignocellulosic fibrous material prepared by chemically or mechanically separating cellulose fibers from wood, fiber crops, waste paper, or rags. Wood and other plant materials used to make pulp contain three main components (apart from water), cellulose fibers (desired for papermaking), lignin (a three-dimensional polymer that binds the cellulose fibres together) and hemicelluloses (shorter branched carbohydrate polymers). The aim of pulping is to break down the bulk structure of the fibre source into the constituent fibres.

Pulp is prepared by mechanically and chemically separating the cellulose fibres and mixing it in water by adding chemical or plant based additives. It can be prepared from both coniferous/softwood and non-coniferous/hardwood trees but coniferous trees are preferred as the cellulosic fibres in them are longer.

Pulp is the major raw material used in papermaking. Hence, the committee felt the need for development of standard for the pulp.

The composition of technical committee responsible for formulation of this standard is given in Annex E.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’.

Indian Standard

WOOD PULP — SPECIFICATION

1 SCOPE

This standard prescribes requirements, methods of sampling and test for chemical wood pulp dissolving, coniferous/softwood bleached pulp and non coniferous/hardwood bleached pulp.

2 REFERENCES

The Indian Standards given in annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

For the purpose of the standard, the terms described in IS 4661 shall be referred.

4. REQUIREMENTS

4.1 Description

The material shall consist essentially of the given wood pulp type and free from foreign matter and visible impurities.

4.2 For wood pulp dissolving, the material shall comply with the requirements prescribed in Table 1 when tested according to the prescribed methods. For coniferous/softwood bleached pulp, the material shall comply with the requirements prescribed in Table 2 and for non coniferous/hardwood bleached pulp, the material shall comply with the requirements given in Table 3.

Table1 Requirements for Chemical Wood Pulp Dissolving

(*Clause* 4.2)

Sl No. (1)	Characteristic (2)	Requirement (3)	Method of Test (4)
i)	Alpha cellulose, percent , *Min*	92	IS 6213 (Part 3)
ii)	Pentosan, percent , *Max*	3	Annex B
iii)	Ash content, percent, *Max*	0.15	IS 1060 (Part 4/Sec 2)
iv)	Acid insolubles (ppm), *Max*	160	IS 1060(Part 4/Sec 11)
v)	Silica (ppm), *Max*	120	Annex C
vi)	Calcium (ppm), *Max*	70	IS 1060 (Part 4/Sec 11)
vii)	Iron (ppm), *Max*	25	IS 1060 (Part 4/Sec 11)
viii)	Brightness , percent ISO, *Min*	88	IS 1060 (Part 4/Sec13)
ix)	Viscosity (1 percent cuprammonium), centipoises	12-18	IS 6213 (Part 4)
x)	S10, percent , *Max*	8	IS 6213 (Part 19)
xi)	S 18, percent , *Max*	5	IS 6213 (Part 19)
xii)	Extractive (DCM), percent , *Max*	0.15	Annex D
xiii)	Moisture, percent, *Max*	10-14	IS 1060 (Part 5/Sec 2)
xiv)	pH (1percent slurry), *Min*	5.5	IS 1060 (Part 4/Sec 7)

Table 2 Requirements for Coniferous/Softwood Bleached Pulp

(*Clause* 4.2)

Sl No. (1)	Characteristic (2)	Requirement (3)	Method of Test (4)
	Fiber Morphology Analysis		
i)	Mean Fiber length, mm, *Min*	2.0	ISO 16065-2
ii)	Fiber diameter, µm, *Min*	25	ISO 16065-2
	Characteristics of Pulp		
iii)	Ash content, percent, *Max*	0.5	IS 1060 (Part 4/Sec 2)
iv)	Brightness, percent ISO	88 ± 2	IS 1060 (Part 4/Sec 13)
v)	Viscosity (0.5 percent cuprammonium), centipoises, *Min*	12	IS 6213 (Part 4)
vi)	Extractive (DCM), percent, *Max*	0.3	Annex D
	Physical Strength Properties of pulp at standard freeness ~ 300 ml CSF/40 SR		
vii)	Burst index, KPam^2/g, Min	6.5	IS 1060 (Part 6/Sec 2)
viii)	Tear index, mNm^2/g, Min	8.5	IS 1060 (Part 6/Sec 1)
ix)	Tensile index,Nm/g, Min	80	IS 1060 (Part 5/Sec 6)

NOTE

Freeness of pulp shall be checked as per method prescribed in IS 6213 (Part 2).

Bauer McNett Fibre classification of Softwood pulp (At Initial Freeness)

Mesh size	*Pulp retained, percent*
+16	55-65
+30	18-20
+50	7-10
+100	5-7
–100	5-8

Table 3 Requirements for Non Coniferous/Hardwood Bleached Pulp

(*Clause* 4.2)

Sl No. (1)	Parameters (2)	Requirement (3)	Method of Test (4)
	Fiber morphology analysis		
i)	Mean fiber length, mm, Min	0.65	ISO 16065-2
ii)	Mean fiber diameter, µm, Min	15	ISO 16065-2
iii)	Ash content , prcent, *Max*	0.8	IS 1060 (Part 4/Sec 2)
iv)	Brightness of pulp , percent ISO	88±2	IS 1060 (Part 4/Sec 13)
v)	Viscosity, (0.5 percent cuprammonium), centipoises, *Min*	6	IS 6213 (Part 4)
vi)	Extractive (DCM), percent, *Max*	0.2	Annex D
	Physical Strength Properties of pulp at standard freeness ~300 ml CSF/40 degree SR (See note)		
vii)	Burst index, KPam^2/g, Min	3	IS 1060 (Part 6/Sec 2)
viii)	Tear index, mNm^2/g, Min	5	IS 1060 (Part 6/Sec 1)
ix)	Tensile index, Nm/g, Min	50	IS 1060 (Part 5/Sec 6)

NOTE

Freeness of pulp shall be checked as per method prescribed in IS 6213 (Part 2).

Bauer McNett Fibre classification of Hardwood pulp (At Initial Freeness)

Mesh size	*Pulp retained, percent*
+30	9-11
+50	50-54
+100	23-26
+200	5-8
–200	7-10

5 PACKING AND MARKING

5.1 Packing

Pulp shall be supplied in bales or rolls or as agreed between purchaser and supplier. The package shall be strapped with iron wire.

5.2 Marking

5.2.1 Each package shall be marked with the following information:

a) Description and weight of the material,
b) Lot number,
c) Month and year of manufacture, and
d) Manufacturer’s name or recognized trade-mark.

5.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed there under, and the products may be marked with the Standard Mark.

6 SAMPLING

Representative samples for the tests shall be drawn as prescribed in ISO 7213.

7 CRITERIA FOR CONFORMITY

7.1 From each set (minimum number of samples) of rolls/bales, selected from the lot (*see* **6**), one roll/bale shall be taken out at random. These rolls/bales shall constitute the sample. The roll/bale selected shall be tested for the requirements given in **4**.

7.2 A role/bale not meeting the relevant requirements for anyone or more characteristics shall be considered as defective.

7.3 A lot shall be declared as conforming to the requirements of this specification if the number of defective bales/rolls found, does not exceed the acceptance number. This acceptance number is zero if the size is less than 13 and one if the size is greater than or equal to 13.

ANNEX A

(*Clause* 2)

REFERENCES

IS No.	*Title*
1060 (Part 4/Sec 2) : 2018	Methods of sampling and test for paper and allied products: Part 4 Methods of test for paper, board and pulps, Section 2 determination of residue (Ash) on ignition at 525 °C
1060 (Part 4/Sec 7) : 2018	Methods of sampling and test for paper and allied products: Part 4 Methods of test for paper, board and pulp, Section 7 Determination of *p*H of aqueous extracts — Hot extraction method
1060 (Part 4/Sec 11) : 2014	Methods of sampling and test for paper and allied products: Part 4 Methods of test for paper, board and pulp, Section 11 Determination of acid soluble magnesium, calcium, manganese, iron, copper, sodium and potassium
1060 (Part 4/Sec 13) : 2020	Methods of sampling and test for paper and allied products: Part 4 Methods of test for paper, board and pulps, Section 13 Measurement of diffuse blue reflectance factor — Indoor daylight conditions (ISO brightness)
1060 (Part 5/Sec 2) : 2021	Methods of sampling and test for paper and allied products: Part 5 Methods of test for paper and board, Section 2 Determination of moisture content of a lot-oven — Drying method
1060 (Part 5/Sec 6) : 2014	Methods of sampling and test for paper and allied products: Part 5 Methods of test for paper and board, Section 6 Determination of tensile properties — Constant rate of elongation method (20 mm/min)
1060 (Part 6/Sec 1) : 2014	Methods of sampling and test for paper and allied products: Part 6 Methods of test for paper, Section 1 Determination of tearing resistance — Elmendorf method
1060 (Part 6/Sec 2) : 2014	Methods of sampling and test for paper and allied products: Part 6 Methods of test for paper, Section 2 Determination of bursting strength of paper
4661 : 1999	Glossary of terms used in paper trade and industry
6213 (Part 2) : 1971	Method of test for pulp: Part 2 Determination of freeness of pulp
6213 (Part 3) : 1971	Methods of test for pulp: Part 3 Determination of alpha, beta and gamma cellulose in pulp
6213 (Part 4) : 1971	Methods of test for pulp: Part 4 Determination of viscosity of pulp
6213 (Part 19) : 1985	Method of test for pulp: Part 19 Determination of alkali solubility of pulp
ISO 7213 : 1981	Pulps — Sampling for testing
ISO 16065-2 : 2014	Determination of fibre length by automated optical analysis — Part 2: Unpolarized light method

ANNEX B

[*Table* 1, *Sl No* (ii)]

DETERMINATION OF PENTOSANS IN THE PULP

B-1 SUMMARY

Pentosans are changed to furfural in 3.85 N hydrochloric acid and collected in the distillate. The material is then analyzed colorimetrically using orginol-ferric chloride reagent.

B-2 APPARATUS

B-2.1 Ice Bath

B-2.2 Distillation Apparatus

B-2.3 Temperature Controlled Electric Heater

B-2.4 Stopwatch

B-2.5 Five, 25 ml Pipettes, 50 ml Flasks

B-2.6 Spectrophotometer or Filter Colorimeter, for measurement of light absorbance at 630 nm which matched glass cells or cuvettes.

B-3 REAGENTS AND MATERIALS

B-3.1 Hydrochloric Acid, 3.85 ± 0.05 N (13.15 percent)

B-3.2 Xylose, Reagent Grade

B-3.3 Ethanol

B-3.4 Sodium Chloride

B-3.5 Orginol, reagent-prepare by dissolving 0.400 g of orginol and 0.500 g of ferric chloride in 1000 ml of 11 N hydrochloric acid. Store the reagent in refrigerator. The mixture should not be kept for more than 15 days.

B-4 PROCEDURE

B-4.1 Place the sample (W) in a boiling flask and add 20 g sodium chloride and about 3.85 N Hydrochloric acid. Further, add few boiling stones in the solution in order to avoid bumping and connect the flask to the distillation apparatus. Mark the level of the acid in the flask and after that add 250 ml of 3.85 N Hydrochloric acid to the seperatory funnel.

B-4.2 Distill the acid by applying heat at a uniform rate of 2.5 ml per min and then collect the distillate in 250 ml volumetric flask which is immersed in an ice bath.

B-4.3 While distillation, add hydrochloric acid drop wise using separating funnel and maintain a constant volume of 100 ml in the boiling flask. Continue the process of distillation for about 90 ± 5 min so that about 225 ml of the distillate can be collected.

B-4.4 Now cool the distillate to a temperature of about 20 °C and add hydrochloric acid (3.85 N) to 250 ml mark and mix it thoroughly. Pipette out 5 ml of the distillate and transfer it to a 50 ml volumetric flask. Further, add about 25 ml of orginol reagent, mix and then place the flask in a water bath at 25 °C.

B-4.5 After 1 h, add ethanol till the mark of 50 ml and mix the solution well. Now keep the solution again on a water bath and again after 1 h, measure the absorbance of the sample at 630 nm with the help of a spectrophotometer using a cuvette or a cell.

B-4.6 Amount of xylan, in mg (X) present in the test sample can be determined by preparing a calibration graph.

B-5 CALCULATION

Calculate the pentosans content in the sample

$$\text{Pentosans } \% = \frac{x}{10W}$$

where

X = xylan in the sample (in mg); and
W = oven dry weight of the sample, (in grams).

ANNEX C

[*Table* 1 *Sl No* (v)]

DETERMINATION OF SILICATES

C-1 APPARATUS

C-1.1 500 ml Kjeldahl Flask

C-1.2 Heating Mantle

C-1.3 50 ml Platinum Dish

C-1.4 Muffle Furnace, which is maintained at a temperature of 525 ± 25 °C

C-1.5 10, 25 and 100 ml Graduated Cyclinders

C-1.6 Filter Paper of Medium Porosity, Ashless, Acid Washed

C-2 REAGENTS

C-2.1 Concentrated Nitric Acid

C-2.2 Concentrated Sulphuric Acid

C-3 SAMPLE

Take a sample of pulp and tear it into pieces. Determine the percent of moisture in the sample by oven dry method and then report the weight of the dried sample.

C-4 TEST SPECIMEN

Take about 25 g of the sample. The size of the sample depends on the content of the silica and should be so adjusted that the weight of the silica is at least around 0.01g. Also weigh the duplicate specimen to the nearest 0.01 g.

C-5 PROCEDURE

C-5.1 Take the sample in 500 ml Kjeldahl flask and add 100 ml of concentrated nitric acid in it. Now warm the sample till pulp becomes a thin paste. The sample slowly heated in order to attain a low viscosity solution. Evaporate the mixture to a 40-50 ml volume, cool the mixture and add 20 ml of concentrated sulphuric acid.

C-5.2 Heat the mixture till white fumes of sulphur trioxide start evolving. Add about 10-20 ml of concentrated nitric acid in small parts without cooling the flask. After each addition, reheat the flask till white fumes of sulphur trioxide comes out. This procedure is repeated till clear, straw coloured solution is obtained. This colour will not darken on further heating. Wet oxidation is completed by removing last traces of nitric acid from the solution. This is done by heating until sulphur trioxide fumes reappears.

C-5.3 Dilute the solution to 250 ml with distilled water after cooling it to the room temperature. Now boil the solution gently for few minutes and filter it through a filter paper which will quantitatively transfer the solids. Further, wash the residue with small portions of distilled water.

C-5.4 Keep the residue on a filter paper (A) on a dried platinum dish. Evaporate the water on the dish and ignite the residue and paper by keeping it in a muffle furnace at a temperature of 525 ± 25 °C till black coloured carbon particles are formed. Cool the dish by keeping it in a dessicator and reweigh it to record the mass (B).

C-6 CALCULATION

$$\mathrm{X} = 1000\frac{A}{B}$$

where

X = silica (as SiO_2), in ppm;
A = Weight of insoluble residue, in milligrams; and
B = weight of the oven dry pulp, in grams.

ANNEX D

[*Table* 1 *Sl No* (xii), *Table* 2 *Sl No* (vi), *Table* 3 *Sl No* (vi)]

DETERMINATION OF EXTRACTIVE

D-1 TEST FOR SOLVENT EXTRACTS

D-1 SCOPE

The procedure describes a methodology for the analysis of solvent soluble and non volatile material in pulp.

D-2 APPARATUS

a) Heating mantle or steam bath;
b) Fume hood;
c) Weighing bottles;
d) Extraction thimbles; and
e) Extraction apparatus — Allihn type or graham condensor, soxhlet extraction flask and soxhlet extraction tube.

D-3 REAGENTS

a) 98 Percent dichloromethane;
b) 95 Percent ethanol; and
c) Reagent grade acetone (minimum purity, 99.5 percent).

NOTE — Acetone and ethanol are highly flammable materials, therefore electric heating or steam heating is recommended. The experiment should be performed in fume hood and open flame should be avoided. Dichloromethane can cause irritation to eyes and can cause narcosis on inhalation.

D-4 SAMPLING

Take an air dry pulp which should be enough to provide two 10 grams test specimens. Now, at the same time, take separate specimens for an accurate analysis of moisture.

D-5 PROCEDURE

D-5.1 Put the extraction thimble having a sample in a clean and dry soxhlet apparatus for extraction and connect it in upright position to the round bottom flask. The round bottom flask should be clean and dry.

D-5.2 Take 150 ml of the solvent in the extraction flask.

D-5.3 Attach the flask with the apparatus for extraction and allow the flow of water through the condenser. In order to provide a uniform boiling rate, adjust the heaters. This will cycle the specimens over about 5 h period for not less than 24 extractions. In case the extraction is left for a longer period of time, there should be a provision to switch off the heat source if the electricity of flow of water shuts off unexpectedly.

D-5.4 From the apparatus, remove the flask and slowly evaporate the solvent in the extraction flask to a volume of 20 to 25 ml. Using small volumes of solvent, transfer the extract to the tared weighing dish. Use tongs or forceps in order to handle the weighing dish. Now keep the sample of weight (A) in a fume hood and evaporate the solvent.

D-5.5 Now dry the contents at 105 ± 3 ^{o}C in an oven and cool it using a dessicator. Weigh the sample (B) to the nearest 0.1 mg.

D-5.6 Now take the solvent for blank determination. Evaporate 150 ml of this solvent to dryness and weigh the residue to the nearest 0.1 mg. The weight of the dried extract (C) is corrected by the weight of the residue.

D-6 CALCULATION

Calculate the extractive content as follows:

$$\text{Extractables, \%} = \frac{A - B}{C} \times 100$$

Where

A = oven dry weight of the pulp, in grams;
B = oven dry weight of extract, in grams; and
C = oven dry weight of the blank residue in grams.

ANNEX E

(*Forward*)

COMMITTEE COMPOSITION

Paper and its Products Sectional Committee, CHD 15

Organization	*Representative(s)*
Central Pulp and Paper Research Institute, Saharanpur	Dr M. K. Gupta (***Chairman***)
Avantha Centre for Industrial Res and Development, Yamuna Nagar	Dr Nishikant Bhardwaj
Ballarpur Industries Ltd, New Delhi	Shri Deepak Sharma Shri Bhushan Awate (*Alternate*)
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Directorate of Printing, Min of Urban Development, New Delhi	Fresh Nomination Awaited
DPIIT, Min. of Commerce and Industry, New Delhi	Fresh Nomination Awaited
Federation of Indian Agro Paper Mills	Nomination Awaited
Federation of Paper Traders Association of India, Mumbai	Shri Dalip Bindal Shri Piyush Jain (*Alternate*)
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Organization	*Representative(s)*
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Shree Mangal (Trade) Enterprises	Shri Narottam Vyas Ms Bhawna Vyas (*Alternate*)
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Member Secretary

Shrishti Dixit
Scientist 'D' (CHD), BIS

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This Indian Standard has been developed from Doc No.: CHD 15 (17017).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg CHANDIGARH 160019	265 0206 265 0290
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Published by BIS, New Delhi